

Functional Plant Biology

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Viewpoint: Is the European attitude to GM products
suffocating African development?

Greg Bodulovic

1069–1075

This Viewpoint article addresses a very significant political issue in international agriculture. With parts of Southern Africa are experiencing the third major drought in five years, the author offers his analysis of political and scientific factors affecting adoption of genetically modified (GM) crops in Africa. Drought-induced food shortages have necessitated the provision of genetically modified crops as food aid to the region by developed nations. The author examines the background and reasons behind the condemnation of GM crops by southern African nations, and considers whether the lack of support of agricultural biotechnology by European nations has contributed to this situation. Furthermore, the necessity of agricultural biotechnology in future African development is considered.

Seasonal courses of maximum hydraulic conductance in
shoots of six temperate deciduous tree species

Krõõt Aasamaa and Anu Sõber

1077–1088

This work investigates an important field: the importance of hydraulic conductance of protoplasts of leaf parenchyma in determining the conductance of leaf lamina. It presents novel and interesting data for ontogenetic changes in shoot hydraulic conductance for six temperate species, and in that of HgCl₂-treated shoots. The authors determine the partitioning of leaf blade conductance between symplasmic (protoplasmic) and apoplasmic conductance, and analyse their effect on whole-lamina hydraulic conductance. Substantial differences were found between fast- and slow-growing species. The main conclusions are that the cell-to-cell and apoplast pathways account equally for temporal variation within a species, while the apoplast pathway more likely accounts for the differences between species. This demonstrates that the cell-to-cell pathway can be significant at normal flow rates through the leaf.

The effects of resource availability and environmental
conditions on genetic rankings for carbon isotope
discrimination during growth in tomato and rice

Jonathan P. Comstock, Susan R. McCouch,

Bjorn C. Martin, Charles G. Tauer, Todd J. Vision,

Yunbi Xu and Roman C. Pausch

1089–1105

Water-use efficiency is an important and challenging trait to evaluate, and this paper provides important new perspectives on its regulation in two major crop systems. This work evaluates the genetic dependence and environmental stability of carbon isotope discrimination (CID) in rice and tomato. The authors evaluate plants grown under a wide range of environmental conditions including variation in temperature, light, nutrient availability, and variable soil volumes. They evaluate genetic and environmental contributions to variation in growth rates, plant morphology, plant nutrient contents, and gas-exchange rates, and compare them to variation shown in CID. They conclude that intercellular CO₂ levels, as indicated by CID, are closely regulated in each genotype in a semi-homeostatic manner.

Cover illustration: Africa urgently needs to adopt modern agricultural technologies to meet the food production requirements of a constantly expanding population. (See Bodulovic pp. 1069–1075.)

Nocturnal stomatal conductance and implications for modelling $\delta^{18}\text{O}$ of leaf-respired CO_2 in temperate tree species

**Margaret M. Barbour, Lucas A. Cernusak,
David Whitehead, Kevin L. Griffin,
Matthew H. Turnbull, David T. Tissue
and Graham D. Farquhar**

1107–1121

This work merges three areas: functioning of nocturnal transpiration, stand-level gas exchange, and isotopic effects. Using archived gas-exchange data from several temperate tree species, the authors evaluate whether stomata are open during the night periods when respiration is positive, and whether stomatal conductance is regulated by environmental or endogenous factors. They demonstrate the effects of open stomata on the modelled stable oxygen isotope composition of leaf-respired CO_2 . The ‘new twist’ on previous reports of nighttime stomatal conductance is modelling its effects on oxygen isotopes. Further, they then determine the differences in $\delta^{18}\text{O}$ in CO_2 respired between the ‘net flux’ and ‘one-way’ models published previously.

Integrated responses of rosette organogenesis, morphogenesis and architecture to reduced incident light in *Arabidopsis thaliana* results in higher efficiency of light interception

**Karine Chenu, Nicolas Franck, Jean Dauzat,
Jean-François Barczi, Hervé Rey and
Jérémie Lecoeur**

1123–1134

These authors investigate changes in plant growth and development associated with alterations in light intensities. Although some of the effects of light intensity on leaf growth have been well characterised, the comprehensive measurements made in this study, which allows detailed modelling of light interception, is a useful contribution to our understanding of the relationship between plant morphology and light capture ability. Three-dimensional virtual plants and a numerical radiative balance were used to quantify the relative effect these changes on the overall efficiency of incident light interception by the rosette. It appears that leaf initiation and early leaf expansion rate respond to absorbed light, while duration of leaf expansion does not.

Are retinal and retinal-binding proteins involved in stomatal response to blue light?

**Fabio Paolicchi, Lara Lombardi, Nello Ceccarelli
and Roberto Lorenzi**

1135–1141

Stomata are crucial in plant adaptive responses to environment, balancing fluxes of water and CO_2 into/from the leaf, and optimising leaf photosynthesis and temperature. Stomata are known to be specifically regulated by the blue light, and these authors hypothesise that rhodopsin-like retinal-binding proteins in stomatal guard cells in *Commelina communis* might be involved in this response. Using epidermal peels characterised by a very high density of intact and living stomata, they identified the chromophore retinal and its involvement in blue light response. Moreover, by using $[^3\text{H}]$ retinal, they show the presence of two high molecular weight retinal-binding proteins in membrane preparations.

Symbiosis of *Acacia auriculiformis* and *Acacia mangium* with mycorrhizal fungi and *Bradyrhizobium* spp. improves salt tolerance in greenhouse conditions

**Diégane Diouf, Robin Duponnois, Amadou Tidiane Ba,
Marc Neyra and Didier Lesueur**

1143–1152

Planting multipurpose, fast-growing and moderately salt-tolerant trees such as *Acacia* spp may reclaim saline soils. These legume trees require that both the microsymbionts (rhizobia and mycorrhizal fungi) and the host be tolerant to salt. This work evaluates the effectiveness of *Bradyrhizobium* strains and mycorrhizal fungi in improving growth, nodulation and mineral nutrition of two species of *Acacia* under irrigation with salt water. The work clearly shows that triple inoculation with *Bradyrhizobium* + *Pisolithus albus* + *Glomus intraradices* significantly improves the growth and mineral nutrition of these very important species.